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31 Aug 98

From: Commander, Naval Facilities Engineering Command, NAVFAC Criteria Office

Subj: INTERIM TECHNICAL GUIDANCE (ITG) - MINIMUM DESIGN LOADS FOR
BUILDINGS AND OTHER STRUCTURES

Ref: (a) MIL-HDBK-1002/1, "Structural Engineering General Requirements", Naval Facilities
Engineering Command, 1987
(b) MIL-HDBK-1002/2, "Loads," Naval Facilities Engineering Command, 1987
(c) NAVFACENGCOM OOC HDN/96-102 ltr dtd 27 Jun 96
(d) NAVFACENGCOM HDN/CHENG ltr dtd 17 Mar 98

Encl: (1) Interim Technical Guidance on Structural Loads

1. Purpose. The purpose of this guidance is to advise facility engineers, planners, and maintenance personnel of the Naval Facilities Engineering Command (NAVFAC) adoption of American Society of Civil Engineer (ASCE) 7-95, "Minimum Design Loads for Buildings and Other Structures", 1995 and enclosure (1).

2. Background. Lack of a nation-wide structural loads standard familiar to Navy engineers, AE consultants, Navy construction representatives, and construction contractors forced the Navy to provide uniform structural load standards for Naval shore facilities by issuing references (a), (b), (c), and (d). The National Technology Transfer Act of 1995, Public Law 104-113, requires the Navy to adopt voluntary consensus standards whenever possible, and in 1995, the ASCE produced ASCE 7-95. The Army Corps of Engineers and the three model building codes, Building Official and Code Administrators (BOCA), International Conference of Building Officials (UBC), and Southern Building Code Congress International (SBC) use ASCE 7-95 with additional requirements for the structural design of buildings and other structures. In June 1997, NAVFAC convened a workshop to develop a plan for adopting consensus standards for structural engineering. Representatives from the Engineering Field Divisions (EFD), the Engineering Field Activities (EFA), the Naval Facilities Engineering Service Center (NFESC), the Chief Engineer's Office, and the Public Works Centers (PWC) agreed to adopt ASCE 7-95 along with supplemental provisions.

Discussion. Adopting ASCE 7-95 and enclosure (1) for determining minimum design loads will allow the Navy to comply with Public Law 104-113 for basic structural engineering. Broad usage of ASCE 7-95 by BOCA, UBC, and SBC ensures sufficient familiarity by designers. ASCE 7-95 forms the basis for the structural load provisions in each model building code. In areas where ASCE 7-95 provides insufficient guidance, enclosure (1) provides supplemental

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technical criteria to ensure adequate structural systems are provided at all Naval shore facilities.

4. Criteria. References (a) and (b) are hereby inactive for new design of facilities in the Continental United States (CONUS), Hawaii, Puerto Rico, Guam, Virgin Islands, and American Samoa. They are superseded by ASCE 7-95 including Commentary and enclosure (1). Continue to use reference (b) for wind and snow loads for facilities outside the Continental United States (OCONUS) until load data is gathered. NAVFAC, along with the Army and Air Force are waiting for the publication of the DOD Weather Manual (P-89), a tri-service document that will include wind, snow and frost depth penetration data for CONUS and OCONUS locations. We anticipate the publication of this document in September 1998. Use references (c) and (d) for the determination of seismic loads for CONUS and OCONUS facilities. For the design of buildings and other structures, addressees should ensure that all new CONUS designs comply with ASCE 7-95 and enclosure (1). In case of a conflict between ASCE 7-95 and enclosure (1), consult the cognizant Engineering Field Division/Activity (EFD/EFA) for clarification.

5. Action.

a. Design. Design all new projects using this guidance.

b. Criteria.

(1) The NAVFAC Criteria Office: Coordinate with U.S. Army Corp of Engineering in the development of tri-service structural engineering criteria.

(2) Guide Specification Division: Revise impacted guide specifications to comply with this guidance.

6. Coordination. This guidance has been coordinated with the structural engineers at each EFD, EFA, PWC, the Navy Crane Center, NFESC, and the Chief Engineer's Office. Address comments and questions on the use of this guidance to the POC.

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5. Points of Contact. For clarification or additional information related to this subject, please contact the NAVFAC Criteria Office, Code 15C. The NAVFAC Criteria Office point of contact is Mr. John Lynch, P.E., DSN 262-4207, FAX 757-322-4416, Internet address *lynchjj@efdlant.navfac.navy.mil*.

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INTERIM TECHNICAL GUIDANCE FOR STRUCTURAL LOADS

A. Inactive for New Design (CONUS only):

Military Handbook 1002/1, "Structural Engineering General Requirements"

Military Handbook 1002/2, "Loads"

(NOTE: Continue to use MH 1002/1 and 1002/2 for OCONUS designs until further notice.)

B. Adopted Primary Consensus Standard:

Minimum Design Loads for Buildings and Other Structures, ASCE 7-95, except as modified below.

C. **NAVFAC modifications to ASCE 7-95 are noted in italics.**

1.1 Scope. This standard provides minimum load requirements for the design of buildings and other structures *except as noted in other Military Handbooks and Design Manuals. Design structures subject to a train of pneumatic truck wheel loads according to the latest edition of "The Standard Specification for Highway Bridges," American Association of State Highway and Transportation Officials. Design structures subject to a train of rail loads according to the latest edition of "Manual for Railway Engineering", American Railway Engineering Association. A structural element is any component of a structure that contributes to the support and/or the restraint of the structure or portion of the structure.* Loads and appropriate load combinations, developed to be used together, are set forth for strength design and allowable stress design. For design strengths and allowable stress limits, design specifications for conventional structural materials used in buildings and modifications contained in this standard shall be followed.

1.2 Definitions.

Authority having jurisdiction: *The Naval Facilities Engineering Command.*

Temporary structures: Buildings or other structures that are to be in service for *less than five years* and have a limited exposure period for environmental loads.

1.5 Classification of Buildings and Other Structures. Buildings and other structures shall be classified, based on the nature of occupancy, according to Table 1-1 for the purposes of applying wind, snow, and earthquake provisions. *In addition to the items in Table 1-1, the following are categorized as Category IV Buildings and Other Structures: (a) Facilities involved in handling or processing sensitive munitions, nuclear weaponry or materials, gas and petroleum fuels (excluding filling stations), and chemical or biological contaminants, (b) Facilities involved in operational missile control, launch, tracking, or other critical defense functions, and (c) Mission-essential and primary*

communication or data-handling facilities. The major claimant should identify mission essential facilities during the planning stages.

2.4.2 Other Load Combinations. The structural effects of F_a shall be investigated in design. *In regards to load combinations that include loads from cranes, consider the following in the building design. All dead and live loads including impact (except for test load condition) plus one of the following.*

- 1. Full wind with no side thrust with crane(s) positioned for maximum vertical effects.*
- 2. Fifty (50) percent of full wind with maximum side thrust and vertical load effects from crane.*
- 3. Full wind with no live load or crane load.*
- 4. Bumper impact at end of runway from crane.*

2.5 Load Combinations for Extraordinary Events. Where required by *Naval Facilities Engineering Command*, strength and stability shall be checked to ensure that structures are capable of withstanding the effects of extraordinary (i.e. low probability) events such as fires, explosions, and vehicular impact.

4.2.1 Required Live Loads. The live loads used in design of buildings and other structures shall be the maximum loads expected by the intended use or occupancy but shall in no case be less than the minimum uniformly distributed unit loads required by Table 4-1 and Table 1 (*Live Loads*) below.

4.2.2 Provisions for Partitions. In Office buildings or other buildings, where partitions will be erected or rearranged, provision for partition weight of *20 psf (minimum)* shall be made, whether or not partitions are shown on the plans, unless specified live load exceeds 80 psf (3.83 kN/m²).

4.3 Concentrated Loads. ...Any single panel point of the lower chord of exposed roof trusses or any point along the primary structural members supporting roofs over manufacturing, storage and warehousing, and *maintenance shop/garage* floors shall be capable of carrying safely a suspended concentrated load of not less than 2000 lbs (poundforce) (8.90 kN) in addition to *other* loads. For all other occupancies, a load of 200 lbs (0.89 kN) shall be used instead of 2000 lbs (8.90 kN).

4.10 Crane Loads. The crane live load shall be the rated capacity of the crane. Design loads for the runway beams, including connections and support brackets, of moving bridge cranes and monorail cranes shall include the maximum wheel loads of the crane and the vertical impact, lateral, and longitudinal forces induced by the moving crane. *For cranes and hoists over 10 tons, contact the Navy Crane Center for assistance in determining loads and coordinating the design elements. MIL-HDBK-1038, Weight Handling Equipment provides design criteria for cranes. The Navy requires annual load tests (static and dynamic) as part of their safety certification program, which are beyond the*

scope of the applicable industry standards referenced in MIL-HDBK-1038. The design of Naval facilities shall use the crane load test conditions, outlined in Appendix E of P-307 "Management of Weight Handling Equipment", in addition to the general load conditions listed herein. {Note: Do not apply impact factors (indicated as a percentage increase to wheel loads noted in paragraph 4.10.2) for test load conditions.}

5.1 Pressure on Basement Walls. See Design Manual (DM) 7.2, "Foundations" for additional requirements.

5.3.3.3 Hydrodynamic Loads. Use the "Shore Protection Manual", 1984 and "Coastal Engineering Technical Notes" Army Corps of Engineers for determination of loads on buildings and other structures.

6.5.3 Exposure Categories. 6.5.3.1 General...Where uncertainty exists, consult the cognizant Engineering Field Division/Activity (EFD/EFA) for clarification as to the appropriate exposure category.

7.2 Ground Snow Loads. Ground snow loads, p_g , to be used in the determination of design snow loads for roofs shall be as set forth in Fig. 7-1 for the contiguous United States and Table 7-1 for Alaska. Site specific case studies shall be made to determine ground snow loads in areas designated CS in Fig 7-1. Ground snow loads for sites at elevations above the limits indicated in Fig. 7-1 and within the CS areas shall be approved by the Naval Facilities Engineering Command.

9. Earthquake Loads. Office of the Chief Engineer, Naval Facilities Engineering Command, letter dated 27 June 1996 (HDN/96-102) provides guidance for new buildings. Office of the Chief Engineer, Naval Facilities Engineering Command, letter dated 17 March 1998 (HDN/CHENG) provides guidance for seismic upgrades in conjunction with rehabilitation, repair, and modernization projects.

10.3 Design for Ice Loads. Consult the cognizant Engineering Field Division/Activity (EFD/EFA).

| Table 1 - Live Loads | | |
|---|---------------------------|---------------------------------|
| Occupancy or use | Uniform Load (psf) | Concentrated Load (kips) |
| Battery charging room | 200 | |
| Boiler houses | 200 | |
| Court rooms | 80 | |
| Day room | 60 | |
| Drawing room | 100 | |
| Galleys: | | |
| Dishwashing rooms (mech.) | 300 | |
| General kitchen area | 75 | |
| Provision storage (not refrigerated) | 200 | |
| Preparation room | | |
| Meat | 250 | |
| Vegetable | 100 | |
| Guard House | 75 | |
| Generator rooms | 200 | |
| Incinerators; charging room | 150 | |
| Laboratories, normal scientific equipment | 100 | |
| Latrines/Heads/Toilets/Washroom | 75 | |
| Mechanical equipment room (general) | 100 | |
| Mechanical room (HVAC) | 125 | |
| Mechanical telephone and radio equipment room | 150 | |
| Morgue | 100 | |
| Post offices: | | |
| General area | 100 | |
| Work rooms | 125 | |
| Power plants | 200 | |
| Projection booths | 100 | |
| Promenade roof | 60 | |
| Pump houses | 100 | |
| Recreation room | 100 | |
| Receiving rooms (radio) including roof areas supporting antennas and electronic equipment | 150 | |
| Refrigeration storage rooms: | | |
| Dairy | 200 | |
| Meat | 250 | |
| Vegetable | 275 | |
| Scrub decks | 75 | |

| Table 1 – Live Loads (continued) | | |
|---|---------------------------|---------------------------------|
| Occupancy or use | Uniform Load (psf) | Concentrated Load (kips) |
| Shops: | | |
| Aircraft utility | 200 | |
| Assembly and repair | 250-400 | |
| Blacksmith | 125 | |
| Bombsite | 125 | |
| Carpenter | 125 | |
| Drum repair | 100 | |
| Electrical | 300 | |
| Engine overhaul | 300 | |
| Store Houses: | | |
| Aircraft | 200 | |
| Ammunition (one story) | 2000 | |
| Cold Storage: | | |
| First floor | 400 | |
| Upper floors | 300 | |
| Building materials | 250-400 | |
| Drugs, paints, oil | 200-300 | |
| Dry provisions | 300 | |
| Fuse Detonator (one story) | 500 | |
| Groceries, wine, liquors | 300-350 | |
| General: | | |
| First floor | 600-1000 | |
| Second floor | 400 | |
| Third floor | 300 | |
| High explosives (one story) | 500 | |
| Inert explosives (one story) | 500-2000 | |
| Light tools | 150 | |
| Paint and oil (one story) | 500 | |
| Pipe and metals (one story) | 1000 | |
| Pyrotechnics (one story) | 500 | |
| Small arms (one story) | 500 | |
| Subsistence buildings | 200 | |
| Torpedo (one story) | 350 | |
| Hardware | 300-400 | |
| Tailor shop | 75 | |
| Telephone exchange rooms: | | |
| Normal | 150 | |
| Locations subject to tremors, gunnery practice or other conditions causing unusual vibrations | 250 | |

| Table 1 – Live Loads (continued) | | |
|--|---------------------------|---------------------------------|
| Occupancy or use | Uniform Load (psf) | Concentrated Load (kips) |
| Terminal equipment buildings (areas other than stairs, toilets, and washrooms) | 150 | |